UNITED STATES PATENT APPLICATION

For

IMPROVED RIVET AND COATING TECHNIQUE

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IMPROVED RIVET AND COATING TECHNIQUE

FIELD OF THE INVENTION

[0001] This invention relates to coated aluminum or aluminum alloy rivets.

BACKGROUND OF THE INVENTION

[0002] It has previously been proposed to coat rivets for protection against corrosion and deterioration. A coating for titanium rivets is disclosed in U.S. Patent No. 3,979,351, granted September 7, 1976 and in related U.S. Patent No. 3,983,304, granted September 28, 1976. In the field of coated aluminum or aluminum alloy rivets, a number of prior patents disclose concurrently curing the coating and heat treating the aluminum alloy rivets. These include the following patents: U.S. Pat. No. 5,944,918, granted August 31, 1999; U.S. Pat. No. 5,858,133, granted January 12, 1999; U.S. Pat. No. 6,221,177 granted April 24, 2001; U.S. Pat. No. 6,274,200 granted August 14, 2001; and U.S. Pat. No. 6,403,230, granted June 11, 2002. Aluminum alloy rivets require special heat treating in order to increase their strength; and the foregoing patents discuss these required heat treatments in some depth. The specifications of these patents, which include discussions of aluminum alloy heat treating are hereby incorporated into this specification by reference.

[0003] It is noted, however, that once an aluminum alloy rivet has been heat treated, additional heating of the rivet to a temperature above about 300°F to cure a coating applied to the rivet, will impair the shear strength of the rivet.

[0004] It is further noted that, with the coatings disclosed in these patents, and the high temperatures used for concurrently both curing of the coating and heat treating of the rivets, the coating is relatively thin, such as about 0.0002 to 0.0005 inch.

SUMMARY OF THE INVENTION

[0005] In accordance with the present invention it has been determined that rivet coatings may be cured at a relatively low temperature, such as about 250°F. This has many advantages, including avoiding any impairment of the strength of the rivets. In addition it provides a somewhat thicker coating on the rivets so that the coating acts somewhat like a gasket, preventing the flow of water or the like past the rivet. More

specifically, the coating is about 0.0007 to about 0.001 or 0.002 inch in thickness. In addition, the coating is softer and more resilient than prior coatings baked at high temperatures.

[0006] The coating may be somewhat similar to that disclosed in the coating for titanium rivets in the –351 and –587 patents, including a resin, solvents, a corrosion inhibitor, and an elasticizer. However, instead of baking at higher temperatures, and concurrently heat treating the rivet and curing the coating, the curing is accomplished at about 250°F, with previously heat treated aluminum or aluminum alloy rivets, so that the shear strength of the rivets is not impaired.

[0007] In addition, as a pre-treatment, the rivets may be sandblasted, preferably with aluminum oxide, and treated with a solution such as alodine containing material such as chromic acid and a compound containing fluorine.

[0008] Instead of the pre-treatment outlined in the preceding paragraph, the rivets may be chromic acid anodized. This type of treatment is known per se and is described, for example, in a text entitled "Coating and surface Treatment for Metals", by J. Edwards, ASM International, Finishing Publications, Ltd. In which see particularly page 37.

[0009] In accordance with a specific method illustrating the principles of the invention, the aluminum alloy rivets may be initially heat treated. Subsequently, after any desired time interval, the rivets may be sandblasted and washed. Following drying, the rivets are coated with a coating including (1) solvents, (2) Resin, (3) a plasticizer and (4) a corrosion inhibitor. The coating is then cured at a temperature of between about 230°F and 290°F for between ½ hour and 1 ½ hours preferably for about an hour. The rivets are later employed in securing two work pieces together, with the thick coating, about 0.0007 to 0.001 or 0.002 inch thick, functioning somewhat like a gasket to seal the rivet hole.

[0010] Advantages of the present invention include (1) increased thickness of the coating; (2) no time constraints are required relative to the time of coating the rivets.

[0011] Other objects, features and advantages of the invention will become apparent from a consideration of the following detailed description and from the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Fig. 1 is a schematic showing of an aluminum alloy rivet with a coating on its surface.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] While the specification describes particular embodiments of the present invention, those of ordinary skill can devise variations of the present invention without departing from the inventive concept.

[0014] Referring more particularly to the single figure of the drawings, it shows an aluminum alloy rivet with a coating 14 on its outer surface. The rivet is initially heat treated to increase its shear strength, with the elevated temperatures and the time of heat treatment depending on the particular aluminum alloy which is employed. The heat treated rivet may be stored for extended periods of time, or may be coated soon after heat treatment.

[0015] The aluminum alloy rivet often has a somewhat oxidized outer surface. The rivets are sandblasted, preferably with aluminum oxide, and washed with an oxidation inhibiting solution, preferably Allodine®, a solution containing chromic acid and a fluorine compound. This material is available from Henkel Surface Technologies, 32,100 Stephenson Highway, Madison Heights, Michigan, 48071.

[0016] Following drying, the rivets are coated by spraying, dipping or other methods with a coating preferably containing the following:

	Material	Grams	%
[0018]	Solvents:		
	Methyl Ethyl Ketone (MEK)	1,250 g.	35
	Ethyl Alcohol	1,250 g.	35
[0019]	Corrosion Inhibitor:		
	Strontium Chromate	260 g.	7
[0020]	Elasticizer:		
	Polyvinyl Butyral	60 g	2
[0021]	Resin:		
	Phenol-Formaldehyde	752 g	21

[0022] Color (Optional):

Blue Dye	10 g	Less than 1%

[0023] **TOTAL** 3,582 g

[0024] While the foregoing represents a preferred coating, it is to be understood that minor departures from the proportions, and the substitution of equivalent materials may be accomplished to achieve the objects of the invention.

[0025] Following coating, the rivets are preferably cured at a temperature of about 250°F for one hour. The temperature may be within the range of from 220°F and 290°F preferably between 240°F and 260°F, and the time of curing may be increased somewhat for lower temperatures and increased somewhat for higher temperatures but should preferably be between ½ hour and 1 ½ hours. As noted above, the shear strength of the rivets may be impaired with temperatures above 300°F, so it is desirable to stay below this temperature.

[0026] Concerning the composition of the coating, the percentages set forth above are preferred, but variations are still operative. Thus, instead of the listed solvents, they may be replaced in whole or part with toluene or acetone, with the speed of drying being in the order of acetone, MEK, Ethyl alcohol and toluene. Thus by way of example and not of limitation, the amount of Ethyl alcohol may be reduced somewhat and some acetone added. Similarly, other equivalent materials may be substituted in whole or part for the corrosion inhibitor, the elasticizer and/or the resin. It is further noted that in some cases where the heat treated rivets are clean and unoxidized, the initial sand blasting step may not be needed.

[0027] In closing, it is to be understood that the foregoing detailed description relates to the preferred method and coated rivet; and various changes and modifications may be made without departing from the spirit and scope of the invention.